Pleasant encounters of the VM Kind – Leveraging on NeCTAR VMs to Achieve Research Outcomes

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ABSTRACT

This paper presents the journey taken by researchers at Queensland Cyber Infrastructure Foundation (QCIF) member universities in achieving research outcomes using QCIF eResearch services. Researchers at University of Southern Queensland (USQ) who need to host web services on tight research budgets encounter the challenge of competing priorities on scarce ICT resources. The process of either setting up a physical server or accessing locally hosted Virtual Machines (VM)s can be time consuming and expensive. This paper provides a study of the journeys of two researchers working on different projects requiring web hosting, detailing their experiences and how use of National eResearch Collaboration Tools and Resources (NeCTAR) VMs is enhancing their research outcomes. Through USQ's QCIF membership, the researchers were able to access NeCTAR VMs and eResearch service support that reduced the time, effort and cost of webhosting services for their research. The key value of the QCIF eResearch service delivered to the researchers was the integrated service model that was responsive to each researcher's unique requirements. The researchers were able to get questions answered and issues resolved in a timely way that allowed for a quick turnaround of their web server implementation. The collaborative approach to providing eResearch services offered by QCIF meant that the researchers in each of QCIF's member universities can draw on the resources, skills and expertise from a larger pool, thus enabling responsiveness, scalability and the agility required to respond to each researchers unique requirements. The eResearch Analysts work in a close network and provide mutual support and collaboration in facilitating researcher outcomes.

INTRODUCTION

This paper begins with a background of the research projects, a description of the challenge, an account of the approach taken to solve the problem, a discussion on the research outcomes achieved and a reflection of the lessons learnt followed by a conclusion. The two research projects were being run in the Australian Digital Futures Institute (ADFI), Collaborative Research Network (CRN) program. The first research project, "Connected Learning" has the goal "to develop and pilot new technology that connects participants through rich online learning communities that satisfy and enhance information requirements" [1]. The project required the use of a web server to run the research to connect teachers in wide geographical area. The second research project, "Remote Laboratories" has the goal to "research innovative ways to build and use Remote Access Laboratory systems in Science, Technology, Engineering and Maths (STEM) education. Specifically a peer-to-peer networking approach to both technical and pedagogical aspects of their use will be researched"[2]. The potential for the research project closely aligned with benefits described in Abhishek Gupta, Laxmikant V. Kale, Filippo Gioachin, Verdi March, Chun Hui Suen, Bu-Sung, Lee, Richard Kaufmann and Milojicic [3] who note "built-in virtualization support in the cloud offers an alternative way to support flexibility, customization, security, migration and resource control".

On exploring the catalogue of services on offer from USQ's ICT service division [4] the researchers made applications for the server hosting service but were faced with the challenge of the cost of investing in physical servers, software, web administration and time delays due to a drawn out contractual agreement process. Consultation with the USQ eResearch Analyst and Division of Research and Innovation resulted in the research projects considering the use of NeCTAR VMs hosted on a Research Cloud NeCTAR [5] which present the opportunity to streamline the application process to access web server capabilities, remove the cost and increase the scalability, access and potential for collaboration and research outcomes.

CONNECTED LEARNING

An ongoing research project led by USQ and in collaboration with 5 other Australian universities is concerned with supporting Australian teachers in the transition from higher education into teaching service [6]. In early 2014 a number of factors came together in this research leading to a need for rapid prototyping of an online solution. The researchers had theorised a potential approach to supporting beginning teachers through a "Question and Answer" style of online platform in a cross-institutional approach, and evidence from empirical studies and focus groups of teacher educators was supporting the need for the work [7]. The aim of the online platform was to involve many of the stakeholders in

Australian teacher education (multiple universities, accreditation bodies, support organisations and government) in creating an altruistic community of support based upon recently developed open source technology.

The urgency for producing a rapid prototype arose due to identification of a potential source of financial support for the research and interest in the work on a number of levels – from other universities, other disciplines and internationally. An open source package, "AskBot", had been identified as a basis for rapid prototyping a design solution. The problems in developing this were time and money, and the project needed to have a prototype before obtaining research funding. Whilst some seed funding had been obtained which was enough to provide the technical expertise for the project, the university's ICT support had informed that a back-end solution to support the work would cost many thousands of dollars and take months to implement. Other alternatives such as paid-for services were considered, but due to the sensitivity of the data and the aims of the project to grow over time (to be a national platform with tens of thousands of users) this was considered unsuitable.

It was lucky that in a meeting with ICT to discuss the problem, the QCIF representative was able to propose a solution using the NeCTAR platform that met the needs of being: (i) rapid; (ii) affordable; (iii) secure; and critically (iv) scalable. The project lead researcher was pleasantly surprised that the NeCTAR VM was available within 48 hours of submitting an application, enabling time to be booked with the developer for the proximal week. As a result the research project was able to demonstrate the fully operating and partly-branded platform to a group of important parties within four weeks of needing the solution; the site was up and working within two weeks of making the request.

The research has benefited through the immediate outcome of being able to demonstrate a working prototype within the time frame needed. Beyond this, and partly because of it, the site is now on track for a 500-user pilot of the website in August 2014 with a view to Queensland-wide use in 2015. The prototype has been useful for facilitating a featured symposium in an upcoming conference and for involving potential collaborators in the research.

In the weeks of rapid development of the prototype, the following features of QCIF (typical of such VM solutions) were identified:

- **Collaboration**: The project was able to make the request for a NeCTAR site and establish it. The web site developer and designers were located in another city, but I was able to facilitate all prototyping after just one face-to-face meeting with each the developer and designers.
- **Standardisation**: There are researchers in Chile and researchers in the Agriculture discipline that are each interested in versions of the same site. The use of VM instances makes such duplication trivial.
- **Speed**: Because all the cyber-infrastructure is integrated it meant that one application provided for all needs – the project did not need to go through separate paperwork with my own university, which would have added to the time.

CONCLUSION

At USQ, collaboration is fundamental to how research is performed. USQ values its strong partnerships with industry, government, the community and a global network of research institutions. By easily connecting researchers, stakeholders and end users, USQ researchers are able to translate their research back into practice, where it increases in value and impact. The NeCTAR VMs allow researchers to quickly and affordably access a high level resource to deliver their research to end users and connect people in geographically diverse locations. This specialised infrastructure is critical to USQ researchers being able to translate their cutting-edge research into real and practical solutions for targeted user groups. Significantly, the use of VMs has provided a scalable solution for this research group, without the cost and lead time required for traditional infrastructure. In a short amount of time, the working prototype has quickly grown from a handful of users, to being on track to reach a 500-user short-term target, as well as being able to further grow and develop for their long-term aim of a state-wide solution. This will dramatically increase the accessibility of this program for recently graduated teachers, which will in turn assist their transition from education training into practice.

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Dr Francis Gacenga is the QCIF eResearch Analyst at the University of Southern Queensland (USQ). He has 15 years' experience in IT service management as a researcher and practitioner. Francis has experience working in government agencies in IT service strategy, design, transition, operation and continual service improvement. He offers a service oriented approach to eResearch service delivery beginning with an understanding of the researchers requirements and offering a suite of cloud compute, storage and collaboration tools, platforms and infrastructure as services that enable data-driven, collaborative research that fosters an interdisciplinary research culture. He conducts research at USQ and has presented research at international conferences and published articles in academic and industry journals. He has worked internationally in information systems development, support, training and management as a systems administrator and computer programmer at the local and state government level and as a lecturer and tutor at the tertiary level. In 2002 the Institute for the Management of Information Systems (IMIS) UK awarded him a gold medal. His research interests include IT service management, eResearch, ITIL, service science, performance measurement, content analysis and design science. He has served as a reviewer in a number of international information systems journals and conferences.

Dr Nick Kelly is a Research Fellow at the Australian Digital Futures Institute (ADFI) at USQ. His research addresses key areas of teacher education, the learning sciences and modelling the cognition of creativity. Nick is currently leading a sub-project within the Collaborative Research Network (Digital Futures) investigating the current support provided to pre-service and early career teachers in Australia, and implementing a cross-institutional online community for mutual peer support. Nick received his received his PhD and postdoctoral training in Design Computing and Education at the University of Sydney after being awarded the University Medal. He is the author of numerous scholarly works and a researcher on national and international grants (http://www.nickkellyresearch.com).

Dr Erin Rayment is the Director of the Office of Research Development at USQ. Erin has a research background in biomedical science with a focus on regenerative medicine. She currently manages USQ's large-scale strategic research initiatives and is focused on maximising research income, increasing the impact of collaborative research programs and translating research into tangible outcomes for end users. Prior to joining USQ, Erin was responsible for providing commercialisation, innovation transfer and research development support at qutbluebox, as well as managing large-scale collaborative research projects at Griffith University. She has advised both commercial and academic clients, being proactively involved from initial concept development to securing industry partnerships and successful funding. In terms of research, Erin completed a PhD on the development of a novel treatment for chronic leg ulcers, and subsequently worked in the United Kingdom on an Innovative Manufacturing Grand Challenge project. In addition to this, Erin has provided consulting services to government agencies and commercial partners, and has been involved in the execution of large multi-party research agreements.